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R. Abbot, Esq.
J. C. Adams, Esq.
G. B. Airy, Esq.
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C. Babbage, Esq.
Adml. Sir F. Beaufort.
M. Biot.
Sig. Boncompagni.
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Dr. I. Zech.

Address delivered by the President, G. B. Airy, Esq. F.R.S., Astronomer Royal, on presenting the Gold Medal of the Society to Mr. Charles Rümker.

Among the various duties, Gentlemen, which devolve on your President, there are none more agreeable than those which refer to the award of the Annual Medal. The discussions in the Council relating to this subject, if it were possible or proper that the public should become acquainted with them, would, I am confident, be matter of pride and satisfaction to the Society. It would be found that the literature, the mathematics, the instrumental constructions, and the observing labours of astronomy, have all engaged the careful attention of the Society's representatives. While the splendid discoveries which have excited the astonishment of the world have received their appropriate notice, the labours of technical character, little known to the public, but indispensable for the establishment of every interesting point in astronomy, have always successfully claimed the sympathy of the Council. Amid this apparent conflict of demands on the Council's attention, no dispute has arisen. Scarcely ever—I believe never—has it occurred

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that in looking back to the award of our medals, we could say that any important subject had been omitted which ought to have been taken into consideration, or that a better choice could have been made than that which we have made.

From the list of persons that have been brought before the Council on the present occasion, Mr. Charles Rümker of Hamburgh has been selected as entitled to the Society's medal, generally for his long-continued labours in Observing Astronomy, specially for the Catalogue of 12,000 Stars, of which the last part was published nearly two years ago.

It is not necessary for me to describe at length the miscellaneous astronomical observations which we owe to Mr. Rümker, but a general notice of them may be thought necessary. Many years since Mr. Rümker first became extensively known by his connexion with the then infant Paramatta Observatory. Some misapprehension on one side or the other as to the precise terms of engagement brought the connexion to a close. I am totally unable to state with accuracy what was the point under discussion, or what were the merits of the two views of it; but I am certainly able to say that no greater misfortune has happened to southern astronomy than the conclusion of that engagement. Since that time Mr. Rümker has been known principally as Superintendant of the Nautical School of Hamburgh, and as Astronomer of the Hamburgh Observatory. It is more particularly in the latter capacity that his labours have attracted the attention of this Society. For a very long time Mr. Rümker has been known as furnishing extrameridional observations of comets and newly discovered planets, possessing the highest degree of accuracy, and extending to times when the objects which *he* could successfully observe were lost to other astronomers furnished apparently with much more powerful means. I have myself visited the observatory and inspected the instruments which have been devoted to these observations, and I have inquired, How is it that with instruments so insignificant, you have been able to see so much more than others could see who are so much better equipped? The answer was very simple. Energy, care, patience,—in these, I believe, is contained the whole secret. Mr. Rümker, perhaps, possesses in perfection the sensibility of eye and the acuteness of ear which are required for the most delicate observations; but these powers, which might seem at first to be original gifts of nature, have, I do not doubt, acquired very much of their activity from their careful and energetic use.

The observations to which I have referred possess that character which makes them known in some measure even to the unscientific part of the public. Those who are least initiated in the secrets of our noble science can appreciate, and with no failing approximation to their true value, the skill and the knowledge which instruct an astronomer, from observations of a new planet at the beginning of a summer, to say precisely where it will be at the end; or which enable him, after intently gazing upon an obscure speck which no

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unarmed eye can see, to predict that ere long there will blaze in a definite portion of the sky one of those portentous objects which have made the hearts of whole nations to flutter. But the practical astronomer knows that, for the successful attaining to these results, much more is necessary which the public cannot appreciate. Above all, there must be extensive and accurate catalogues of stars. I might use a somewhat inaccurate architectural comparison, and say that these are analogous to the foundation of a building. I may adopt a much more exact engineering illustration, and say that they are closely similar to the bench-marks which the surveyor must lay down for his great hydraulic constructions. The traces of these commonly disappear from the eye. In looking at the lofty cathedral or the gorgeous palace, we seldom reflect on the care which has been required to establish the foundation; in viewing the aqueduct which supplies our cities with water, or the canal which bears its commerce, we scarcely think how great pains have been required, and have been given, for the determination of the heights of seemingly unimportant points, which perhaps the public in general never see. But, let the building sink in irreparable ruin, or let the levels of the canal be so faulty that its current is stopped, or overflows, or is turned in the wrong direction, and all the world can then understand how important was the omission of those preliminary preparations, on which, if successful, they would not have bestowed a thought.

The accurate determination of the position of numerous stars has always, in the flourishing times of astronomy, claimed the energetic attention of astronomers. In modern times it was Flamsteed who gave to this principle its most extensive developement. In estimating his labours, it must be borne in mind that he had himself to construct the appropriate instruments, that he had to determine fundamental points (commencing with those related to the sun's motion), as well as places merely referred to them, and that he calculated all the results and reduced them to a tabular form. The experience of subsequent years has shown that it is not easy, in an official observatory charged with peculiar responsibilities, to keep up this extent of cataloguing, observation, and reduction; but unceasing attention has been given at Greenwich to the determinations of the equinoctial zero and of the places of a limited number of stars. A nearly similar plan, sometimes with additions, has been followed at other principal observatories, as Königsberg, Cambridge, &c. and the catalogues thus formed, though restricted in the number of stars, have been the best bases for the extended catalogues of which I have now to speak.

It would be a long task to describe the different catalogues, reduced to different degrees of perfection, and exhibited in different forms, with which Astronomy is now enriched; and it would be invidious to attempt to apportion the different degrees of merit which I think ought to be ascribed to them. Still I cannot entirely avoid attempting this distinction, for without it I should fail in conveying to you a proper idea of the estimation in which I hold the work to which your medal is awarded. In spite, then, of some defects arising from instrumental imperfections, I must characterise the Madras Catalogue of our late member, T. G. Taylor, as the greatest catalogue of modern times. In the number of observations and the number and distribution of the stars, and in the circumstance that the observations were made, reduced, combined, and printed, at the same place and under the same superintendance, it bears the palm from all others. But this was the fruit of an endowed observatory, the work of an astronomer and competent assistants, whose strength was not exhausted by any other employment. After this come such works as Groombridge's Catalogue (admirably observed, but reduced by its author only in the first degree), and many others, among which I will not attempt to discriminate. The Berlin and other star-maps, on which the points have been laid down by estimation merely, may be considered as in the same grade. The catalogues of lowest degree are those which consist merely of observations of zones of stars published in the order in which they are made, as the *Histoire Céleste*, Bessel's *Zones*, &c., whose form has been found so imperfect that following astronomers have been compelled, for alleviation of their own labour, to bring them to the state of a finished catalogue. I should be sorry to be understood as setting a low value either on the accuracy or on the extent of these zone-observations, but I do desire to convey my impression, of the imperfection of their form and the small expenditure of labour which they exhibit. Perhaps no one who is not familiar with the processes of observation, daily reduction, annual reduction, and combination of different years' places of stars, can conceive how trifling is the work of mere observation compared with that of reducing and cataloguing the results.

If, now, we estimate the work of Mr. Rümker by the rules which I have in some measure indicated, we shall find that it occupies a very high place. The number of stars in the complete Catalogue (more than twelve thousand) exceeds that of Taylor's. In the number of observations of each star, it is exceeded by Taylor's, but in almost every instance the number may be considered as sufficient. The observations have all been made with a first-rate meridional instrument. The stars, principally, but not entirely, in the northern hemisphere, have been selected with the special objects of filling up the gaps in the heavens left by the *Histoire Céleste* and Bessel's Zones, and of supplying accurate places of the comparison-stars employed in numerous extrameridional observations. The observations have been completely reduced, combined for one epoch, and printed in the form of an arranged catalogue. Every star is furnished with the star-constants which are necessary for reducing its mean to its apparent place (or *vice versâ*), in Bessel's manner. For those stars which are known or suspected to have sensible proper notion, the apparent place resulting from every individual observation is given. The whole of

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the work, observation, reduction, combination, and superintendence of printing, appears to have been done by Mr. Rümker himself; the preparation of the star-constants only, with some other minor parts of the calculations, being due to his friends Messrs. Weyer and Funk.

In my estimate of the value of this Catalogue, it is no small merit that, though intended to supply the defects in the extent of other works and thus to make a symmetrical whole, it has not made a symmetry of imperfections it has furnished: as supplement to two very incomplete publications, one of the most finished pictures of a large portion of the heavens which Astronomy possesses. It is also important that, while on the one hand, it possesses all the compactness of an epitomised Catalogue, on the other hand it furnishes in every case, in which it appears probable that the speculator on proper motions will require them, all the necessary details of individual observations. The annexation to the star's places of the constants for daily reduction, is an improvement which up to this time had been confined (so far as I am aware) to British Catalogues.

Had this Catalogue proceeded from an Observatory of which the personal establishment was charged with no other labours, we should have considered it as a highly meritorious work. The understood restriction on the disposal of our Medal would probably have prevented us from bestowing on it that last mark of our respect, but we should in our public report have alluded to it as one of the most admirable astronomical undertakings of its time. What, then, shall we say to this work in the circumstances under which it has reached us? It has come, the voluntary enterprise of an individual, who could not, by any construction of his connexion with the Hamburgh Observatory, be supposed to owe to the world a hundredth part of the labour which it has cost. It is the fruit of observations made in the watches of night, and calculations made in the leisure hours of the day, by a person who would seem, to vulgar eyes, to be engrossed to the limits of human endurance by an onerous professional office. Well may we consider it as a remarkable instance of voluntary labour, undertaken under difficult circumstances, not for public display, but as an aid to science, and skilfully and steadily directed to that purpose alone. I am confident that the award of the Council is supported by the approval of every member of this Society, and I will now place the Medal in the hands of our Foreign Secretary with a request that he will transmit it to Mr. Rümker.

The President then delivering the Medal to Mr. Hind, addressed him in the following terms:—

Mr. Hind,—I request that, in the name of the President and Council of the Royal Astronomical Society, you will transmit this Medal to Mr. Charles Rümker, as awarded to him for his astronomical observations in general, and for his Catalogue of twelve thousand stars in particular. No one knows better than yourself